

## PNEUMOMEDIASTINUM AND SUBCUTANEOUS EMPHYSEMA IN A PATIENT WITH COVID-19: A CASE REPORT

---

***Marina Lucena Aguiar Roriz***

Radiology Department, ISCEP/São Carlos  
Imagem, Fortaleza, Ceará, Brazil

***Yves Damon Gonçalves Feitosa***

Radiology Department, ISCEP/São Carlos  
Imagem, Fortaleza, Ceará, Brazil

***Huylmer Lucena Chaves***

Radiology Department, ISCEP/São Carlos  
Imagem, Fortaleza, Ceará, Brazil

***Raimundo Noberto Lima Neto***

Radiology Department, ISCEP/São Carlos  
Imagem, Fortaleza, Ceará, Brazil

***Antonio Roriz Neto***

Intensive Care Department, Hospital  
Regional do Cariri (HRC), Juazeiro do Norte,  
Ceará, Brazil

All content in this magazine is licensed under a Creative Commons Attribution License. Attribution-Non-Commercial-Non-Derivatives 4.0 International (CC BY-NC-ND 4.0).



**Abstract:** Covid-19 is an acute respiratory infection caused by the coronavirus SARS-CoV-2, and millions of people have been infected worldwide. Specially in the beginning of the pandemic, many serious cases were reported, requiring hospitalization and ventilatory support. In this context, pneumomediastinum has become more common and, in the absence of direct airway injury, it can be attributed to the Macklin effect. Although most cases of pneumomediastinum are treated conservatively, it is related to patient's worse prognosis when associated to Covid-19.

**Keywords:** COVID-19, pneumomediastinum, subcutaneous emphysema.

## CASE REPORT

A 66-year-old male patient, hypertensive and diabetic, was admitted to a hospital in Fortaleza, Ceará, Brazil, presenting respiratory symptoms after confirmation of viral pneumonia due to COVID-19.

Computed tomography (CT) of the chest was performed on admission and can be seen in Figure 1.

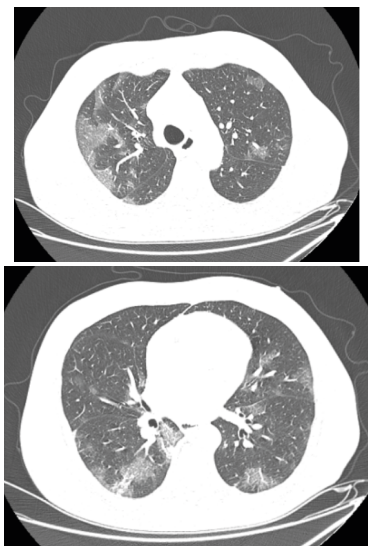


Figure 1: Chest computed tomography (04/21/21 - 11:08 pm). Multiple ground-glass pulmonary opacities, predominantly peripheral.

The patient, who was admitted to the ward, developed severe acute respiratory syndrome (SARS) on 05/01/2021, having been transferred to the Intensive Care Unit, due to the need for supplemental oxygen. He did not undergo non-invasive mechanical ventilation, as he was uncooperative. In this case, the medical team opted for orotracheal intubation, which was successful.

The patient remained in serious condition, maintained on mechanical ventilation via an orotracheal tube, and 13 days later, new imaging tests were requested (Figure 2), which showed moderate subcutaneous emphysema associated with pneumomediastinum, without evidence of pneumothorax.

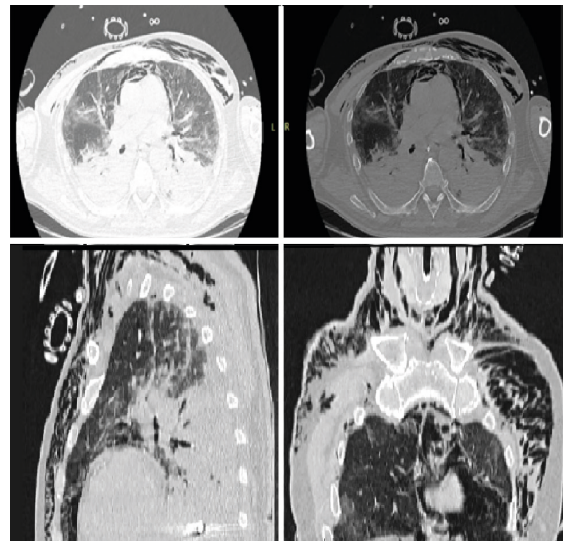


Figure 2: Chest computed tomography (05/04/21 - 4:48 pm). Moderate subcutaneous emphysema, which extends throughout the thoracic and cervical region associated with mild pneumomediastinum. Bilateral diffuse ground-glass pulmonary opacities associated with an extensive area of consolidation in the posterior lung fields, forming an anteroposterior gradient. There are no signs of pneumothorax. Non-selective orotracheal tube.

After the CT, adjustments were made to the mechanical ventilation parameters and the patient was evaluated by the thoracic surgeon, who defined conservative management

(surveillance).

A new control chest CT was performed 27 days after the previous one (Figure 3), showing persistence of pulmonary findings and remission of subcutaneous emphysema, as well as pneumomediastinum. However, after 90 days of hospitalization (9 days in the ward and 81 days in the intensive care unit), the patient died, due to the severity of the disease.

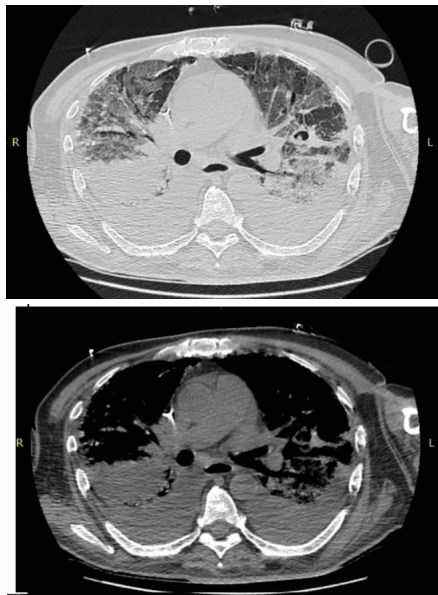


Figure 3: Computed tomography of the chest (05/31/21 - 9:27 pm). Bilateral diffuse ground-glass pulmonary opacities associated to an extensive area of consolidation in the posterior lung fields, characterizing an anteroposterior gradient. There is no evidence of pneumomediastinum. Well positioned tracheostome.

## DISCUSSION

Pneumomediastinum can be spontaneous, also known as primary, or secondary to iatrogenic, traumatic, and non-traumatic causes (1). It has become more common after the COVID-19 pandemic, as it is a known complication in these patients and can be attributed to mechanical ventilation strategies, for example the need for higher PEEPs (2), as

well as reduced lung compliance in the infected.

In the present case, the patient's orotracheal intubation was uneventful, reducing the hypothesis of airway injury due to direct barotrauma and further corroborating the occurrence of the Macklin effect, related to heterogeneous lung involvement (areas of normal parenchyma adjacent to areas affected by COVID).

The pathophysiology of this condition, first reported by Macklin and Macklin in 1944 (3), consists on alveolar rupture secondary to a pressure gradient between the alveoli and the interstitium. Consequently, air leakage occurs, which goes along the bronchovascular sheath to the pulmonary hilum, reaching the mediastinum. This air can also extend to the cervical subcutaneous tissue, as we observed in the this case, and also to the pleura, pericardium, peritoneal cavity and epidural space.

It is known that, in most cases, the treatment of pneumomediastinum is conservative, and consists of rest, oxygen therapy and analgesia, if necessary, unless the patient also presents pneumothorax (4). However, Pneumomediastinum in COVID-19 is not benign as in other conditions. For this reason, it should be immediately recognized (1), once it may be associated to worse prognosis (5), as we could see on this case.

## CONCLUSION

Pneumomediastinum has become more common after the COVID-19 pandemic and, in the absence of direct airway injury, can be attributed to the Macklin effect.

This condition is self-limiting and should be treated conservatively in most cases. However, its coexistence with COVID-19 infection may be related to an unfavorable prognosis for patients.

## REFERENCES

- 1- Ganessane, E. et al. Pneumomediastinum in COVID-19 disease: Clinical review with emphasis on emergency management. *J Am Coll Emerg Physicians Open*. 2023 Apr 10;4(2):e12935.
- 2- Shrestha DB, Sedhai YR, Budhathoki P, et al. Pulmonary barotrauma in COVID-19: a systematic review and meta-analysis. *Ann Med Surg (Lond)*. 2022;73:103221.
- 3- Macklin, M. T., Macklin C. C. Malignant interstitial emphysema of the lungs and mediastinum as an important occult complication in many respiratory diseases and other conditions: interpretation of the clinical literature in the light of laboratory experiment. *Medicine*. 1944;23:281–358.
- 4- Volpi, S. et al. Pneumomediastinum in COVID-19 patients: a case series of a rare complication. *Eur J Cardiothorac Surg*. 2020;58:ezaa222.
- 5- Bonato, M. et al. Pneumothorax and/or Pneumomediastinum Worsens the Prognosis of COVID-19 Patients with Severe Acute Respiratory Failure: A Multicenter Retrospective Case-Control Study in the North-East of Italy. *J Clin Med*. 2021 Oct 21;10(21):4835.

